REMARKS

This Amendment responds to the Office Action dated September 2, 2003. Based upon the foregoing amendment and following comments, Applicant respectfully requests reconsideration and allowance of the application. Claim 1 has been amended in order to better define Applicant's invention. Accordingly, claims 1-55 are under consideration.

35 U.S.C. §§ 102(b) & 103 REJECTIONS AND OBJECTIONS

Claims 1, 10, 23, 24, and 37 have been rejected under 35 U.S.C. 102(b) as being anticipated by Grumstrup et al. US 6,1921,321. Claims 3 and 50 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Grumstrup et al. in view of Owen US 5,838,561. Claims 2, 4-9, 11-22, 25-36, 38-49, and 51-55 were objected to as being dependent upon a rejected base claim. Applicant respectfully traverses these rejections and objections.

Non-obtrusive Monitoring

Under Section 2131, the MPEP directly states: "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *See Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987). Applicant respectfully suggests that the cited prior art does not expressly or inherently contain the elements recited in Applicant's amended claim 1 or in original claims 10, 23, 24, and 37. Amended independent claim 1 now recites a method for determining the existence of an instability within a process control loop wherein *both the process control loop and the process control device* are connected on-line in a process control environment. More specifically, the determination is made under normal operating conditions when both the process control loop and the process control device are *continuously in service*. One with ordinary skill in the art will recognize and appreciate that

many process applications (e.g. short time constant processes such as small volume tank level control) cannot accommodate control interruption or intervention to any degree. Short time constant processes or fast loops are "tightly tuned" for high performance and can quickly go unstable if a momentary disconnection of the process control device occurs. As now claimed in independent claim 1, neither the process control loop nor the process control device is taken out of service or disconnected, even momentarily, (i.e. bypass, shutdown, or disconnected) when the determination of an instability is made. One with ordinary skilled in the art readily understands that the estimation unit disclosed within Applicant's specification operates in "parallel" to the process control loop. The continuous parallel monitoring of the process occurs without disturbing the process or disconnecting and disabling control. *See* Figure 1; *see also* page 8, lines 25-33 and page 9, lines 5-9. Applicant's invention passively monitors the process and non-obtrusively collects operational data. Based upon the various process parameters collected, a determination as to whether a process instability exists can be made.

Inapposite to Applicant's invention, Grumstrup et al. obtrusively invades the control and operation of the process control loop by momentarily disconnecting the controller (i.e. the process control device) from the loop and placing local control of the loop under the diagnostic test unit to superimpose a test signal directly into the process. *See* col. 3, lines 45 - 53 (replacing control signal from process control device with diagnostic test signal); *see also* col. 4, lines 62- 67 and col. 5, line 1-14 (imposed test signal minimally disturbs the process - both in duration and magnitude) ; *see also* col. 8, lines 51-64; (minimal test signal to reduce any detrimental effect of the diagnostic test to the process; *see also* col. 10, lines 60-65 and col. 11, lines 1-11 (must limit the interference of the process by reducing both the time and magnitude of the diagnostic test).

Effectively, the teachings of Grumstrup et al. are limited to a series connection of the diagnostic test unit to the process control loop. The definition of "on-line" in Grumstrup et al. is necessarily limited to the process remaining on-line, that is the process is not bypassed nor shutdown. Alternatively, the process control device does not remain continuously operational. *See* col. 3, lines 1-18; *see also* col. 4, lines 61-67. Grumstrup et al. disconnects the servo control loop of the process control device and momentarily applies a test signal to use within the process control loop to collect the device parameters of the process control device. Those skilled in the art recognize this disconnection as taking the process control device off-line or out of service.

As claimed, Applicant's invention provides non-obtrusive monitoring of a process control loop or device. The process control loop and/or its process control devices are not removed, not disconnected, not placed in bypass, nor are test signals superimposed upon the control signal. Therefore, Applicant respectfully submits that amended claim 1 is patentably distinct from Grumstrup et al. and is in allowable form.

Instability Determination

Additionally, original independent claims 10, 23, and 37 were directed towards a method or an apparatus that *determines the source of an instability* within the process control loop. These teachings are not present, either expressly or inherently, in the prior art. Applicant clearly discloses and claims an invention that deterministically resolves the source of an instability within a process control loop. *See* page 10, line 24 through page 11, line 21 (determination of the origin of instability within the servo loop or external to process control loop); *see also* page 11, lines 22-31 (determination of servo loop instability); *see also* page 12, line 16 through page 13, line 22 (determination of external instability such as packing friction or process flow forces on control element).

To the contrary, the teachings of Grumstrup et al. are limited solely to determining *parameters or characteristics within process control devices* while operating in a process control environment. As stated by the Examiner in the present office action, Grumstrup et al. "teaches a method of *determining the existence* of an instability within a process control loop." *See* col. 6, lines 10-14 (emphasis added); *see also* col. 7, lines 4-16(performing an analysis to determine the existence of an instability). As understood by one with ordinary skill in the art, measuring device parameters or characteristics (i.e. dead band, dead time, or hysterisis) **is not** equivalent to determining the cause of an instability. These collected parameters are merely metrics that demonstrate the existence of non-desirable control loop characteristics – not the origin or cause. The teachings of Grumstrup et al. directly refer to the method and apparatus disclosed as providing status of "health or operating conditions of the process control device." *See* col. 5, lines 10-19.

Furthermore, the device parameters collected within the teachings of Grumstrup et al. are uniquely related to the process control device within the process control loop. *See* col. 1, lines 6-10 (invention relates to deterministically obtaining parameters of a process control device); *see also* col. 3, lines 2-17 (process control device parameters such as dead band, dead time, and time response are deterministically measured). Grumstrup et al. **does not** reach beyond the process control device to record, and more significantly, to diagnose the origin or source of the process instability. *See* col. 5, lines 10-15. Thus, for these reasons and the foregoing remarks, Applicant respectfully submits that Applicant's invention in neither anticipated or suggested within the teachings of Grumstrup et al. and that independent that claims 1, 10, 23, and 37 are patentably distinct from Grumstrup et al. and in allowable form.

Additionally, in view of the foregoing remarks, the rejection of dependent claim 24 is no longer valid. As previously presented, Applicant's invention, and specifically original

independent claim 23, is not anticipated by Grumstrup et al. Claim 23 is directed towards a *system for determining a source of instability* within a process control loop. Grumstrup et al. neither expressly nor inherently teaches instability source determination. Grumstrup et al. only teaches the reporting potential problems to operators. *See* col. 9, lines 45-53. The cited prior art reference does not determine the cause. Therefore, with reference to the cited prior art, claim 24, being dependent upon claim 23, is also in allowable form.

The Office Action further rejects claim 3 and 50 under 35 U.S.C. 103(a) as being unpatentable over Grumstrup et al. in view of Owen. Applicant respectfully traverses these rejections. All the claim limitations must be taught or suggested in the prior art. *See In re Royka*, 490 F.2d 981 (CCPA 1974). Clearly, Grumstrup et al. in view of Owen does not teach or suggest, in combination, a method to determine the existence of an instability in a process control loop as now claimed in claim 1 nor a system, as originally claimed in claim 37, to *determine the source of an instability* within a process control loop. As previously stated, Grumstrup et al. teaches the momentary disconnection of the process control device and the superposition of a diagnostic test signal on to the process to measure specific process control device parameters if an instability is detected. Because the rejections under Grumstrup et al. can no longer be maintained, Applicant's respectfully suggests that the obviousness rejections of claim 3 and 50 under Grumstrup et al. in view of Owen should be removed.

Applicants respectfully submit that amended claim 1 and the remarks presented herein have placed the application in condition for allowance. As such, amended independent claim 1 and independent claims 10, 23, and 37 are in allowable form. Further, dependent claims 2-9, 11-22, 24-36, and 38-55 which are dependent upon the aforementioned independent claims should now be allowed. Reconsideration of the application is respectfully requested.

CONCLUSION

Thus, for the reasons stated above, the Applicants submit that the specification and claims are in proper form and are clearly patentable over the prior art. Therefore, reconsideration of the application is respectfully requested.

Respectfully submitted,

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